



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Horiba Instruments Incorporated – Contract Testing Services
2890 John R. Road
Troy, MI 48083

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

while demonstrating technical competence in the field(s) of

CALIBRATION & TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of calibrations and/or tests to which this accreditation applies.

ACT-1312

Certificate Number

ANAB Approval

Valid to: 02/24/2018

Version No. 001 Issued: 12/04/2015



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated January 2009*).



ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Horiba Instruments Incorporated – Contract Testing Services

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CALIBRATION and TESTING

Valid to: February 24, 2018

Certificate Number: ACT-1312

I. Mechanical

| FIELD OF TEST | ITEMS, MATERIALS OR PRODUCTS TESTED | SPECIFIC TESTS OR PROPERTIES MEASURED | SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED | *DETECTION LIMIT/ RANGE/ EQUIPMENT |
|--|-------------------------------------|---------------------------------------|---|---|
| Radial Loading (force / strain) | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Actuator up to 100 000 pounds-force / 2 500 µε (micro-strain) |
| Axial Loading (force / strain) | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Actuator up to 100 000 pounds-force / 2 500 µε (micro-strain) |
| Torsional Loading | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Rotary Hydraulic Actuation up to 5 000 pound-feet; Dynamometer up to 5 000 pound-feet |
| Dynamic Loading (Force/Acceleration/ Strain) | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Actuator up to 100 G's/measure up to 500 G's / 2 500 µε (micro-strain) |
| Dynamic Torsional Loading | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Rotary Hydraulic Actuator up to 2 500 pound-feet; Dynamometer up to 5 000 pound-feet |
| Static Pressure | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Pressure up to 20 000 psi |
| Dynamic Pressure | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Pressure up to 10 000 psi |
| Rotational Speed | Customer Supplied | Fatigue and or Durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Dynamometers/Motors up to 18,000 RPM |



II. Dimensional Inspection / Measurement

| FIELD OF TEST | ITEMS, MATERIALS OR PRODUCTS TESTED | SPECIFIC TESTS OR PROPERTIES MEASURED | SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED | *DETECTION LIMIT/ RANGE/ EQUIPMENT |
|-----------------------------|-------------------------------------|---------------------------------------|---|--|
| Linear Displacement | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Hydraulic Actuator – up to 20 in / measure –up to 20 in |
| Angular/Rotary Displacement | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Encoder: +/- 2 880 ° Inclinometer: +/- 90 ° (Digital Gage) |

III. Thermodynamic / Environmental

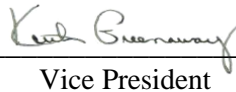
| FIELD OF TEST | ITEMS, MATERIALS OR PRODUCTS TESTED | SPECIFIC TESTS OR PROPERTIES MEASURED | SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED | *DETECTION LIMIT/ RANGE/ EQUIPMENT |
|--|-------------------------------------|---------------------------------------|---|--|
| Temperature (Static and Dynamic) | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Thermal Chambers (- 100 to 250) °F Natural Gas Burners up to 2 000 °F |
| Relative Humidity (Static and Dynamic) | Customer Supplied | Fatigue and/or durability | Customer Supplied and/or F12-LMS-Test-Acceptance-Document | Thermal Chamber Humidifier/Steam Generator (25 to 95) %RH |

IV. Mechanical Calibration

| PARAMETER / EQUIPMENT | RANGE | CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S) |
|-----------------------|---------------------------------------|--|---------------------------------|----------------------------|
| Flow ² | Up to 30 slm (Standard Liters/Minute) | 21.881 mL/min | Gas Divider-Checker (GDC) | WI-QM-B-009 WI-QM-B-019 |
| Flow ² | Up to 30 slm (Standard Liters/Minute) | 0.006 mL/min | Span Gas Divider (SGD) | WI-QM-B-010 WI-QM-B-020 |

Notes:

- * = As Applicable
- Flow calibration is only available at the laboratory's satellite site located at 5900 Hines Drive, Ann Arbor, MI 48108
- Calibration and Measurement Uncertainties (Expanded Uncertainty) are based on approximately a 95% confidence interval, using a coverage of k=2
- This scope is formatted as part of a single document including the Certificate of Accreditation No. ACT - 1312


 Vice President